EIS

United States Department of the Interior

GEOLOGICAL SURVEY
South Central Region
P. O. Box 26124
Albuquerque, New Mexico 87125

FILE

August 19, 1981

The Honorable Harry Early
Governor, Pueblo of Laguna
P. O. Box 194
Laguna, New Mexico 87026

Dear Governor Early:

Attached for your information is a copy of a letter dated August 6, 1981, from the Deputy Conservation Manager--Mining, South Central Region, U. S. Geological Survey, to the Chairman, Anaconda EIS Team.

This letter requests that Anaconda submit additional information to support the proposed Jackpile-Paguate Reclamation Plan.

Sincerely yours,

Marc E Nelson

Marc Nelson
Task Force Leader

Enclosure

United States Department of the Interior

GEOLOGICAL SURVEY
South Central Region
P. O. Box 26124
Albuquerque, New Mexico 87125

August 6, 1981

Mr. William E. Gray
Chairman, Anaconda EIS Team
555 17th Street
Denver, Colorado 80217

Dear Mr. Gray:

This office and the EIS Task Force have completed our review of Anaconda's Jackpile-Paguate Reclamation Plan, the associated consultant reports, and Anaconda's responses to our previous questions on the reclamation plan. Attached are requests for further clarification to complete our assessment of Anaconda's plan, and complete the EIS. Also attached are informational copies of WRD comments related to the hydrologic reports of your consultant. We recommend direct discussion between Hydro-search, Inc., and Mr. Bud Zehner (WRD) to address these hydrologic concerns.

Please submit five copies of your responses to the clarification questions to this office as soon as possible. Your responses will be included as an addendum to the Reclamation Plan, and will, therefore, be public information. Please submit all proprietary information under separate cover, so it may be held confidential.

Sincerely yours,

(ORIG. SGD.) EDWARD T. SANDELL, JR.

Edward T. Sandell, Jr.
Deputy Conservation Manager-
Mining

Enclosures

cc:
EIS Task Force Leader
File - ACE 8-1
Chrono

RABrady:ab: 08-06-81

PREVIOUS QUESTIONS

Question 15:

Please revise Plate 4.1-4 to show the locations of all proposed ventholes for NJ-45 and P-13.

Question 16:

Please state the criteria used to determine the location of the bulkhead in the P-10 decline.

Question 18:

What type of material is being used to backfill the stopes? To what level are the stopes being backfilled?

Question 21:

Please provide the following information on stockpiles SP-1 through SP-12:

1. Average grade.
2. Tons of reserve.

In addition, the list of sub-economical stockpiles shown in Anaconda's response to Question 21 is inconsistent with the stockpiles shown on Plate 4.1-2. Please correct this discrepancy.

Question 22:

Please revise your response to this question, to include the reserves for the P-17 area.

Questions 51 and 52:

Please state the specific value that Anaconda will use as "background" and explain how this value was derived.

Question 54:

Plate 4.1-2 shows that stockpile SP-1 will be milled, but your response to this question states that this stockpile is backfill material. Which is correct?

NEW QUESTIONS

Question 81:

Please list all of the fixed equipment that will remain in the mine buildings after reclamation is completed. In addition, provide an estimate of the reclamation staffing plan, including number of man months, wages in 1981 dollars, and skills needed.

Question 82:

Please explain the purpose for the approximately one dozen wells drilled in the vicinity of well M-15, and provide all data taken from these wells.

Questions regarding the report "Hydrogeologic relationships, Rabbit Ear and P-10 holding ponds, Jackpile-Paguate Mine, New Mexico" by Hydro-search, Inc.

General Questions.

1. Regarding water-quality samples - How were the samples collected and treated? Were wells pumped prior to sampling and, if so, approximately how much water was removed? How long after sampling was filtration done? What was the pore size of the filter? Was pH taken in the field? Were portions acidified and how long after sampling was this done?
2. Tables 1, 2 and 3. What is "NMEID standard"? What is the reference from which this standard was taken?
3. How, specifically, were wells constructed? Was the annulus between the 5 inch drillhole and 2 inch PVC casing cemented, backfilled, or left void? If the wells were not cemented, why does the report refer to water level measurements as potentials in the Jackpile sandstone when they would actually represent a composite of potentials in all saturated strata open to the wells? Were any wells open only to single hydrologic units?
4. If the annular space in well 10 was not cemented, why is it stated that the well is open only to alluvium, when the entire annular space may be hydraulically connected?
5. Potentiometric contours on figures 4 and 5 reflect the gaining reaches of the Rio Paguate and Rio Moquino, but why don't they relect the losing reach of the Rio Paguate upstream?

Questions relating to specific parts of the report.

1. p. 24, last para. The eleven wells are completed near pits and ponds, yet it is stated that ranges and concentrations of major ions are considered to be unaffected by mining activity. On what is this statement based? Were concentrations compared to wells open to similar units outside the mine area? Is there a page missing between 24 and 25 that contains this information?
2. p. 26. Why are the ranges and averages considered natural concentrations for radiological constituents? By figures 4 and 5, wells 3, 6, 7 and, possibly 9 would show little or no affect by flow from the mined areas. Wells 2, 4 and 5 are located in the mined areas, and have both uranium and radium-226 concentrations several times greater than wells 3, 6, 7, and 9. Wouldn't this indicate some ground water is affected by mining or ponding?
3. p. 28, first para. This explains low radionuclide concentrations in well 11, but why are concentrations several times greater in wells 2, 4, and 5, as compared to most wells?
4. p. 41. What verification is there that large volumes of water did not move from the ponds to the aquifer, when input volume to the ponds are not known?

5. p. 41, first para. Again, why are lower radionuclide concentrations in well 11 addressed, but not higher concentrations in wells 2, 4 and 5, in which radium-226 concentrations approach those in Rabbit Ear Pond? Also, the Jackpile aquifer was never shown to be "relatively impervious", and well control is insufficient to show ground-water mounding, so how can the statement be made that there was little or no movement of pond water into the Jackpile sandstone?

Questions regarding report "Ground-water hydrology of the Jackpile-Paguate Mine, New Mexico" by Hydro-search, Inc.

General Questions

1. How were "M" and observation wells constructed? Specifically:
   (a) What was the borehole size in which casing was set? Was more than one bit size used?
   (b) Was the annulus between casing and borehole wall (other than well M25) cemented? If so, through what interval were they cemented? If they were not cemented, were they backfilled with material (cuttings?), gravel packed, or left void? If they were gravel packed, through what interval was the gravel pack set and what material is above or below the pack?
   (c) If only the Jackpile sanstone interval was cemented in well M25, what material, if any, was used to fill the remaining part of the annulus?
2. Presently (June, 1981), the annular space in many "M" wells is either a narrow void space for many feet in depth, or infiltration of runoff into the annular space has caused depressions more than a foot in depth around the wells. Drainage area toward these annular voids and depressions is several hundred square feet in places (well M3 for example). What assurance is there that: (1) heads described in the report reflect only heads in the rocks or alluvium, and not ground-water mounding due to rainwater infiltrating the annului, and (2) water samples collected from these wells in the future will not reflect the concentrations in runoff that may enter the well annuli?
3. If the annuli of wells were backfilled instead of cemented, does not the backfill constitute a hydraulic connection between all hydrologic strata penetrated? If the annuli cause hydraulic connection through strata other than the Jackpile sandstone, why is the water-level data used to describe potentials in this unit when they would actually represent a composite head reflecting potentials in all saturated strata open to the well?
4. Water levels in wells M4B, M4C and M11A closely represent the position of the water table in alluvium (assuming heads due to runoff infiltrating the annuli are negligible), because they are open only to alluvium. Was the position of the water table (not reflecting composite heads) in bedrock overlying the Jackpile sandstone determined? Other than the brief comment on p. 20, were values for vertical gradients obtained between: alluvium -- Jackpile sandstone, Dakota Sandstone -- Jackpile sandstone, or within individual strata? If so, what areas show significant vertical flow, and in what direction?
5. Are there any wells constructed in pits that are now at least partially backfilled (as is part of the south Paguate pit) to verify ground-water recovery times discussed at the end of the report?

6. The report states that wells M17 and M24 are completed in fill material above the Jackpile sandstone. Does this mean the wells bottom in fill material, bedrock other than Jackpile sandstone, or at the ground surface?
7. On page 2 it is stated that the report is intended to provide detailed hydrologic information for use in designing a reclamation plan. Some major hydrologic concerns in reclaiming the mine area are the rates of leaching of radionuclides and other minerals from waste piles and backfill. Were these rates determined? If not, what wells are suitable for determining these rates? Was chemical data collected during the study? What wells are suitable for obtaining background chemical data? What wells are suitable for collecting chemical data that may reflect changes from natural conditions, particularly discharge from waste piles and pit backfill? Does precipitation directly infiltrate waste piles and pit backfill? If it does, how much infiltrates, at what rate, and what may be done to reduce the infiltration?
8. What method of analysis was used to analyze aquifer tests, and why was the particular method used? Where and how may the drawdown-recovery data from aquifer tests be obtained? Why are aquifer characteristics obtained separately for the pumped wells and observation wells when, usually, one set of parameters is obtained for both wells? Were heads measured prior to pumping to determine if pre-pumping levels were stable?
9. Did any wells penetrate Mancos Shale? If so, which wells and at what depths? Is there a saturated zone in the Mancos Shale in the mine area?

Questions relating to specific parts of the report.

1. p. 16. If boundary conditions affected the aquifer test of well M10, were values of T and K corrected for these conditions, and how were they corrected? If not corrected, why were the values included in computing means?
2. p. 16, last sentence. The water levels in five wells (M1, M2, M10, M16 and M21)) of the seven wells tested were below the top of the Jackpile sandstone in 12-3,4-80, so what would constitute a confining layer to produce confined conditions? Could not the low storage coefficients indicate unconfined conditions with low effective porosity? If the low storage coefficients indicate low effective porosities, could not ground water velocity exceed that computed in an earlier study by Hydro-search (Pond Study), for which an effective porosity of 0.1 was used to compute tens of feet per year ground-water velocity?
3. P. 16. What were the distances between observation wells and pumped wells?

4. Table 2. Using the relationship T/K = b (saturated thickness), b of pumped and observation wells correspond closely for all well sites except M16 (9.4 ft vs. 53 ft) and M21 (14 ft vs. 75 ft). Was there that much difference in b between the pumped and observation wells? What is meant by "average T" and "average K" and what values were used to compute the averages?

5. p. 18, second para. Considering that: (a) the aquifer test at well M10 was affected by boundary conditions, (b) the K of well M1 is similar to those in the Jackpile pit area, (c) the K of well M16 is similar to those in the Paguate area, (d) results of aquifer tests on well M16 are questionable because of the large difference in b between pumped and observation well, and (d) the other wells represent a small sampling of K in the mine area - is it really likely that these tests show significant differences in hydraulic conductivity for the Jackpile aquifer in the Paguate pit area, as compared to the Jackpile pit area?

6. p. 18, second para. What about wells supplying: (a) Anaconda housing on the mine site, (b) the P-10 shop, and (c) the Old Jackpile Shop - didn't these supply more than a few gallons per minute?

7. p. 19, first para. For years wells in the Jackpile sandstone supplied sufficient water for use in a housing area on the mine property, and for use in maintenance shops on the site. Springs (in pit bottoms) have supplied water for continuous road conditioning. These supplies were probably essential for mine operation. Would not these constitute "significant quantities" of water, so that the Jackpile sandstone is indeed an "aquifer"?

8. p. 20, first sentence. Is there proof that recharge to the Jackpile sandstone occurs DIRECTLY from precipitation? Exposures of the Jackpile sandstone on the southwest part of the mine are in the Oak Canyon area. If this is a recharge area, why is it shown on figure 5 as a discharge area?

9. p. 23, fourth para. Aren't wells used to supply housing and shops? Aren't wells shown in table 4 used?

10. Figure 6. Why don't potentials reflect losing reaches along the Rio Paguate? What wells were used in constructing potentiometric contours south of trhe P-10 mine area, and in the vicinity of Oak Canyon? Or are these inferred?

11. p. 25, first para - states that the Jackpile sandstone is effectively isolated from units above and below. Yet, on p. 20, it was stated that much of the recharge to the Jackpile sandstone comes through the Dakota Sandstone. How can the Jackpile sandstone be effectively isolated, yet receive substantial recharge from overlying rocks? How long was pumping sustained in well M3 (Jackpile sandstone well) in order to observe the lack of head change in well M25 (open to the underlying Brushy Basin), and what measuring accuracy was used? Isn't it likely that long-term pumping and long-term water-level measurements would show head changes in the Brushy Basin, illustrating differences in hydraulic conductivity betyween the two units, rather than "hydraulic isolation"?

12. p. 26, first para. What values were used to compute the 22 gpm discharge? The rate of movement through the South Paguate pit area alone is about 14 gpm, using a gradient of 40 ft/3000 ft (fig. 6), K of about 0.3 ft/day (table 2), width of 4500 ft and thickness of about 150 ft (fig. 3).
13. p. 29, last para. What were the other values used in computing ground-water flow?
14. P. 35, first para. From p. 33, the depth to water in well M24 (completed in backfill) was 242 ft, which, if assumed to be measured from the top of the casing, was at an elevation of 5984 ft. This well is near wells M23 and "Pond study number 4". From the Hydro-search pond study report, the stream elevation adjacent to well 4 is 6000 ft. Doesn't this mean that the water level in well M24 was 16 ft below the stream level, instead of the 40 ft stated in this report? More importantly, the water level in well M23 (north of well M24 and adjacent to the stream) was at elevation 5952 ft (table 3). Because the south side of the dump (eventually to become part of pit backfill?) in which M24 is located is exposed by the deep excavation of the South Paguate pit, isn't it likely that a water table has developed in the waste pile due to direct infiltration of precipitation? Moreover, doesn't this mean that water in backfill is presently moving into the alluvial and/or bedrock aquifers, and that the "14 years to reach equillibrium levels" (stated on p. 40) has little or no relationship to the time required for ground water to move from fill material toward streams? What was the water level in well M17, and how did it relate to water levels in material adjacent to the backfill?
15. p. 35, second para. The northwest edge of the Jackpile pit has a low area which is at least partly fill material. Isn't bedrock excavation here below the top of the Jackpile sandstone, so that this area constitutes an outlet to the Rio Paguate?
16. p. 35, second para. Won't at least as much water move through the Jackpile pit as is transmitted by the aquifer, and heads at the downgradient end of the fill be the same as in the aquifer when equillibrium is established? Considering that recharge from direct precipitation on fill material will probably be greater than through bedrock, isn't it possible that a local recharge mound could develop in fill material, so that flow through the pit will be greater than that transmitted by the aquifer alone?
17. p. 36, first para, last sentence. This assumes that there is no local recharge to the fill material (though not stated in the report). Isn't it possible that local recharge could cause heads to be greater than under pre-mining conditions?
18. p. 36, last sentence. What were the values used to determine an "18.2 gpm" rate of captured water?